Measurement and Analysis

Process Description Document

(FAA-iCMM PA 18)

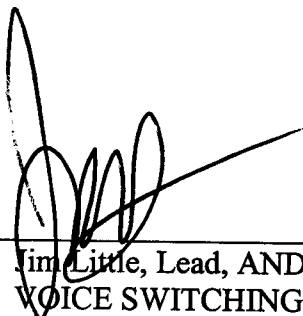## FOR

VOICE SWITCHING
AND
RECORDING

Approved by _____ Date 4/2/03

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Document Change History

Version	Date	Description of Change
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AND-320 Measurement and Analysis Process Description Document

Table of Contents

List of Tables

List of Figures

1.   Overview

The AND-320 Measurement and Analysis Process Description Document establishes a context for measurement and analysis activities in support of the organization's and higher-level management's quantitative information needs. The quantitative information goals and needs are based on the business needs of the organization.

The main goal for the measurement and analysis process is the tracking of actual performance against established plans and objectives. Measurement capability may be integrated into individual project Work Breakdown Structure (WBS) elements (e.g., Quality Assurance (QA), Configuration Management (CM), Risk Management (RM)) or into one project function.

The implementation of measurement and analysis activities ensures the Voice Switching and Recording Product Team achieves its objectives by measuring and analyzing measurement data important to the organization. In addition, measurement and analysis is designed to collect needed information so as to identify potential problems before the problems escalate. It aids Management in the development of corrective action early to avoid the growth of the problem. It facilitates Management in making informed decisions on it program objectively and based on measurement data. Measurement and analysis can also be used to measure the Voice Switching and Recording Product Team's capability. The measurement and analysis process is on going for the duration of the project, taking place at all organization levels down to functional area teams, (such as deployment team, requirements team) and individual practitioners. Measurement is essential for an organization to manage quantitatively. Properly executed, it also lays the groundwork for the Voice Switching and Recording Product Team to achieve higher maturity levels.

Section 2 defines the purpose and scope of the process. Section 3 identifies the principal participants in measurement and analysis and summarizes their responsibilities. Section 4 lists the organizational activities (OA) along with their purpose and definition. Section 5 provides the technical activities (TA) and tasks needed to complete the measurement and analysis process. Section 6 discusses the assumptions made in the application of the measurement and analysis process within the Voice Switching and Recording Product Team.

2.   Purpose and Scope

The purpose of this document is to describe the process for the measurement and analysis process area as it applies to Voice Switching and Recording Product Team acquisitions under the FAA Acquisition Management System (AMS). This process provides information to support the decisions and recommendations in several other processes. The measurement and analysis process spans all phases of the FAA lifecycle management system from the mission analysis phase to the service life extension phase. The measurement and analysis goals are:

- Measurements related to goals, objectives and major issues are established.
- Measurement data are collected, analyzed and results are reported.
- Measurement data and results are stored for use.

The measurement and analysis provides a basis for the Voice Switching and Recording Product Team to measure their activities and report the findings to the appropriate management levels. It enables the Voice Switching and Recording Product Team to make critical decisions regarding implementation activities and resource allocations based on objective measures in a changing political and economic environment.

In this process description document, the term "product" is the final output of the Voice Switching and Recording Product Team or one of its components. The "process" is the integrated set of activities the organization performs to produce the "product."

The measurement and analysis process described in this document applies to the Voice Switching and Recording Product Team, including acquisition sub-teams.

Measurement and analysis is a supporting process area that relates to any process and it interfaces strongly with Quality Assurance. It provides valuable information to Management, allowing it to assess project performance quantitatively.

3.   Roles and Responsibilities

The roles and responsibilities of key measurement personnel and interfacing practitioners are described in Table 3-1.

Table 3-1 Roles and Responsibilities

Role Title	Responsibilities/Value-Added	Knowledge, Skills, or Experience[1]
Customer	• Provides quantitative requirements	• System functional knowledge
ARA Directorate/ Deputy Director	• Support ARA Policy Statement • Establish quantitative measurement goals for Directorate • Review quantitative data developed for the Directorate	• FAA-iCMM Executive Overview
Integrated Product Team Leader	• Ensure measurement and analysis practitioners are trained • Establish quantitative measurement goals for the IPT • Review quantitative data developed for the IPT	

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[1] Knowledge, Skill or Experience categories denoted with an "*" means such knowledge and skills applies to both Management and practitioners.

Role Title	Responsibilities/Value-Added	Knowledge, Skills, or Experience[1]
Product/ Functional Team Leader	• Include process in Product Team planning • Reinforce process performance • Provide project orientation with respect to Measurement &Analysis • Promote measurement and analysis within project team • Promote communications with senior management on quantitative measures • Measurement and analysis advocate • Establish measurement goals to be used by the project team • Review quantitative data developed for the project	
Organizational Practitioner	• Measure and analyze process/product compliance in accordance with measurement and analysis process • Perform the measurement and analysis process • Record and report measurement and analysis • Ensure product quality	• Product outputs/outcomes
Quality Assurance and Management Practitioner	• Perform the measurement and analysis related to Quality Assurance	• Quality Assurance and Management knowledge and skills • Measurement and analysis outputs • Measurement and analysis goals • Process and product verification and reporting methods
Configuration Management Practitioner	• Perform the measurement and analysis related to Configuration Management	• Configuration Management knowledge and skills • Measurement and analysis outputs • Measurement and analysis goals • Process and product verification and reporting methods
integrated Engineering Working Group (iEWG) members	• Monitor process improvement activities • Focal point for process improvement • Maintain and update process documentation	• Systems/software engineering expertise • Process definition experience • Organizational change • Process improvement champion •

4. Organizational activities

Organizational activities constitute the day-to-day actions involved in the measurement and analysis process. It is the performance of these activities that institutionalizes the measurement and analysis process within the Voice Switching and Recording Product Team's culture. The organizational activities listed below are numbered to correspond with the Capability Level 2 Generic Practices (GPs) identified in the FAA-iCMM v2.0.

**Table 4-1. Organizational activities (OAs)**

OA No.	Title	Activity
OA-1	Establish Organizational Policy	Support the existing *ARA Work Process Performance and Improvement Policy Statement* for performing the management, lifecycle, and support processes. This policy statement is the overreaching policy for directing ARA directorates on process performance and improvement efforts in accordance with the *Acquisition Management System (AMS) Policy*, Section 1.14, *Acquisition Management Process Improvement*.
OA-2	Document the Process	Establish written descriptions of the TAs and associated tasks so that people know what to do, review, and improve.
OA-3	Plan the Process	Establish and maintain a plan to accomplish the objectives of the process. Obtain buy-in from stakeholders.
OA-4	Provide Adequate Resources	Allocate and obtain adequate resources for performing the measurement and analysis process. Resources include people, funding, tools, equipment, and facilities.
OA-5	Assign Responsibility	Assign responsibility, authority, and commitment for performing measurement & analysis.
OA-6	Ensure Skill and Knowledge	Ensure that the people performing the process are appropriately trained in how to perform the process. Identify training needs or required skills to conduct measurement & analysis.
OA-7	Establish Work Product Requirements	Requirements may come from customers, policies, standards, laws, and regulations. Ensure that people performing and supporting the measurement and analysis functions have the necessary skills and knowledge.
OA-8	Consistently Use and Manage the Process	Consistently use the documented plans, standards, processes and/or procedures in implementing and managing the process.
OA-9	Manage Work Products	Place identified work products under appropriate levels of configuration management within the

OA No.	Title	Activity
		program/project. This step is required to ensure the work product's integrity throughout the lifecycle.
OA-10	Objectively Assess Process Compliance	Solicit people not directly responsible for managing or performing the work products to assess the adherence of the performed process to previously agreed upon requirements.
OA-11	Objectively Verify Work Products	Similar to OA-10 except here the emphasis is to "objectively" verify the actual work products with credible assurance.
OA-12	Measure Process Performance	Measure performance against established plans. Examples would be a measurement against cost, schedule, quality, customer satisfaction, etc.
OA-13	Review Performance with Higher Management	Management review may be routine or event-driven. Routine review would be scheduled reviews. Event-driven reviews could be a nonconformance report by a quality assurance practitioner and/or the lack of corrective action. Keep management and the sponsor involved and informed about the process.
OA-14	Take Corrective Action	Take corrective action when requirements are not satisfied, noncompliance is identified, and/or progress deviates significantly from the plan.
OA-15	Coordinate with Participants and Stakeholders	Coordination and communication is a necessity to ensure mutual understanding of changes to plans, processes, activities, requirements, and responsibilities.

5. Technical Activities

Specific measurement data provide the basis for performance analysis. Data may be collected and analyzed. Analysis results may be reported and archived. There should be flexibility in the data collection and analysis process to allow an update if deemed necessary. Strong coordination with the Quality Assurance and Management Process Description Document, if any, is needed in the measurement and analysis Process Description Document. Figure 5-1 shows the measurement and analysis process flow.
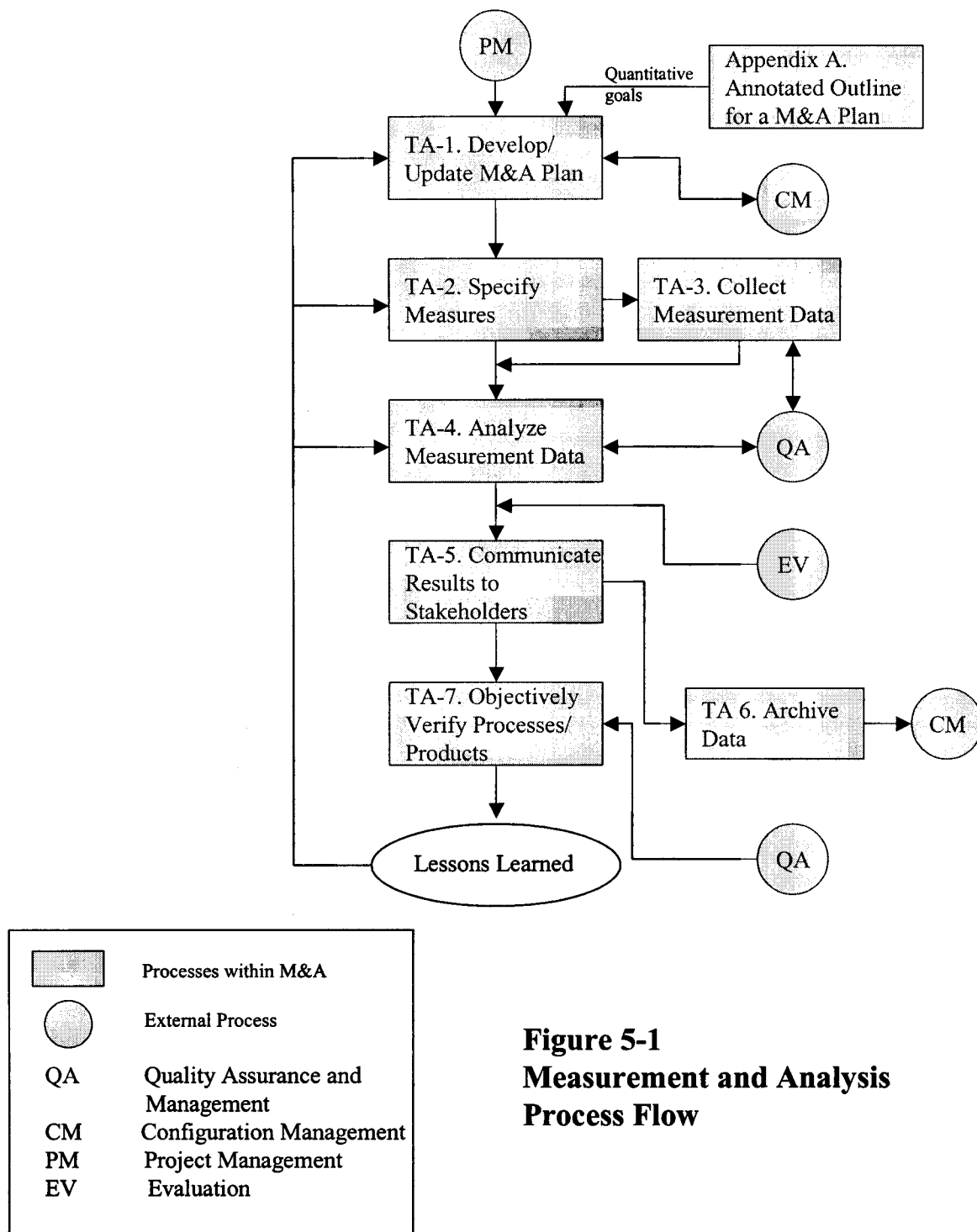
**Figure 5-1
Measurement and Analysis
Process Flow**

TA-1 Develop/Update an Organization Measurement and Analysis Document

A measurement and analysis document, properly developed and executed may enhance the quality of the product/service of the project. This measurement and analysis document emphasizes the development of quantitative goals. It could be a stand-alone document, or be part of a Quality Assurance document or the Project Management document. This document would typically include:

- Overview – describes in general terms the role of measurement and analysis in the organization.

- Purpose and Scope – defines the purpose and scope of the measurement and analysis plan at your organizational level.

- Measurement Specification – describes the actual data and types of data to be collected.

- Collection Method Specification – describes how the data are collected.

- Analysis Procedures – outline the procedures and criteria for analyzing the measurements (both based and derived).

- Reporting – Describes the types of reports generated and the frequency of reporting, tying into the overall project schedule.

- Resource Requirement – identifies the needed resource for your project.

- Schedule – provides a timeline that is consistent with the program/project lifecycle.

- Stakeholders Involvement – specifies how to communicate with different stakeholders.

- Measurement and Analysis Plan Update – includes a provision for updating the measurement and analysis plan as needed. .

TA-2 Specify Measures

Establish measures based on goals. Many issues in the life cycle of a project can be related to a measurement category upon which specific measures can be derived[2]. The relative mix of these types of measures constitutes different operational issues, which need to be addressed.

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[2] For example, a project may classify measures as Measurement of Effectiveness (MOE), Measure of Suitability (MOS) and Measure of Performance (MOP).

For example, if a Project's main concern is schedule and progress, then the Project should track milestone dates, critical path performance, requirement status, problem report status, etc. There are several approaches which help the project identify common measures from common issue areas. The Practical Software & System Measurement (PSM) [http://www.psmsc.com] and Balanced Score Card (BSC) [http:/www.bscol.com] are such examples.

The output of this effort would be a list of candidate measures. Specifications of the measures are reviewed for appropriateness with potential users and stakeholders. When priorities are set or changed, specifications of the measures may need to be revised.

TA-3 Collect Measurement Data

Once a list of candidate measures has been developed and finalized, identify existing sources of data that are generated from normal work products, processes, or transactions. In addition, identify measures for which data are needed, but might not be readily available. A series of alternative data measures may be developed to meet the project goals.

After data has been collected, perform data integrity checks. Identify errors and sources of missing data early in the measurement and analysis cycle. Integrity checks can include scans for missing data, out-of-bounds data values, and unusual patterns and correlation across measures. The activities within this process area may be coordinated with the comparable activities in the Quality Assurance Process Description Document.

TA-4 Analyze Measurement Data

Collected data are analyzed according to the methods specified in the measurement and analysis plan. Conduct additional analyses as necessary, review results with affected parties, and note necessary revisions for future analyses. Data analysis should be based on the criteria for interpreting the results as specified in a measurement and analysis document.

The results of planned analyses may suggest additional, unanticipated analyses. In addition, they may identify needs to refine existing measures, to calculate additional derived measures[3], or even to collect data for additional measures to properly complete the planned analysis.

The initial results are reviewed with affected stakeholders. It may be appropriate to review initial interpretations of the results with the data originator before disseminating and communicating them more widely.

When appropriate, refine the analysis criteria, and update a measurement and analysis document. Valuable lessons that can improve future efforts are often learned from conducting data analyses and preparing results. Similarly, ways to improve measurement specifications and data collection procedures may become apparent from the process. New ideas for refining information needs may also result from this exercise.

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[3] Derived Measures are defined as measures that originate from other data, typically by combining two or more base measures.

TA-5 Communicate Results to Stakeholders

Communicate measurement and analysis results to stakeholders in a timely and usable fashion to support decision-making and assist in making improvement to the project. Affected stakeholders may include intended users, sponsors, data analysts, data providers and management. Assist stakeholders in understanding the measurement results.

Report results in a clear and concise manner appropriate to the methodological sophistication of the stakeholders. Make the communication understandable, easily interpretable, and clearly tied to identified information needs and objectives. *It is important that measurement and analysis personnel do not report Quality Assurance analysis results.*

TA-6 Archive Data

After reviewing the data to ensure their completeness, integrity, accuracy, and currency, store the data and measurement related information appropriately (i.e. with proper configuration management control) to enable the timely and cost-effective retrieval of historical data and results. Information typically stored includes the following:

- Measurement plans
- Specifications of measures
- Sets of data that have been collected
- Analysis reports and presentations

The stored contents are controlled and made accessible by appropriate groups and personnel. Control of stored information is necessary to prevent the stored measurement data from being used inappropriately. Measurement and analysis data may be placed under an appropriate level of configuration control.

TA-7 Objectively Verify Processes/Products

Explicit in the FAA-iCMM, the measurement and analysis process is objectively verified by an entity not directly involved with the project. This entity could be the project Quality Assurance (provided that it is not involved in the measurement and analysis process), a higher-level Quality Assurance or a Quality Assurance practitioner working on another project.

6. Relationship to the FAA-iCMM

This Measurement and Analysis Process Description Document was developed to reflect the requirements of the process improvement model. A complete listing of the relationships between this Process Action and other Process Actions is presented in PA 18 in the section *Relationships between this PA and other PAs.* Table 6-1 provides a cross-reference between the Technical Action and the measurement and analysis Base Practices and the Generic Practices described in FAA-iCMM v2.0. Table 6-2 is a sample list of artifacts that support the Measurement and Analysis Base Practices and Generic Practices. Both charts cross-reference the Generic Practices for Capability Level 2.

Table 6-1 Mapping of Technical Activities[4] to measurement and analysis BPs and GPs

FAA-iCMM v 2.0 Base Practice	1.0 Overview	2.0 Purpose and Scope	3.0 Roles and Responsibility	TA-1 Develop/Update an Organization measurement	TA-2 Specify Measures	TA-3 Collect Measurement Data	TA-4 analyze Measurement Data	TA-5 Communicate to stakeholders	TA-6 Archive Data	TA-7 Objectively Verify Processes/ Products
BP 18.01 Establish Measures Based on Goals				X	X					
BP 18.02 Collect Relevant Measurement Data						X				
BP 18.03 Store Data and Results									X	
BP 18.04 Analyze Measurement Data									X	X
BP 18.05 Communicate Results								X	X	X
GP 1.1 Identify Work Scope				X						X
GP 1.2 Perform the Process					X	X	X	X		
GP 2.1 Establish Organizational Policy	X		X	X						
GP 2.2 Document the Process				X						X
GP 2.3 Plan the Process			X	X						
GP 2.4 Provide Adequate Resources			X							
GP 2.5 Assign Responsibility			X							
GP 2.6 Ensure Skill and Knowledge			X							
GP 2.7 Establish Work Product Requirements					X					
GP 2.8 Consistently Use and Manage the Process				X						X
GP 2.9 Manage Work Products				X	X					X
GP 2.10 Objectively Assess Process Compliance.										X
GP 2.11 Objectively Verify Work Products										X
GP 2.12 Measure Performance						X	X			X
GP 2.13 Review Performance with Higher-level Management								X		
GP 2.14 Take Corrective Action								X		
GP 2.15 Coordinate with Stakeholders								X		

[4] Some of the Generic Practices cannot be easily mapped to Technical Action. These relationship are included in this table for completeness.

Table 6-2 List of Documents that Supports BPs and GPs

FAA-iCMM v 2.0 Base Practices	Action Items	ARA Policy Statement	Base Measures	Candidate Measures, A List of	Checklists	CM Plan	Data Analysis Procedure	Data Analysis Reports	Data Collection Procedure	Data Repository	Derived Measures	Evaluation Criteria	measurement and analysis Briefing	measurement and analysis Plan	Measurement Data Set	Meeting Minutes and Agendas	Project Management Plan	QA Plan	QA Report	Summary Reports	Trend Analysis Reports	Verification Report
BP 18.01 Establish Measures Based on Goals		X												X								
BP 18.02 Collect Relevant Measurement Data				X					X		X				X							
BP 18.03 Store Data and Results										X												
BP 18.04 Analyze Measurement Data												X								X	X	
BP 18.05 Communicate Results													X			X				X	X	
GP 1.1 Identify Work Scope														X								
GP 1.2 Perform the Process							X		X													
GP 2.1 Establish Organizational Policy		X																				
GP 2.2 Document the Process						X			X					X								
GP 2.3 Plan the Process														X								
GP 2.4 Provide Adequate Resources														X								
GP 2.5 Assign Responsibility														X								
GP 2.6 Ensure Skill and Knowledge														X								
GP 2.7 Establish Work Product Requirements														X								
GP 2.8 Consistently Use and Manage the Process	X					X								X			X					
GP 2.9 Manage Work Products	X				X												X					
GP 2.10 Objectively Assess Process Compliance.					X																	X
GP 2.11 Objectively Verify Work Products																						X
GP 2.12 Measure Performance																	X		X		X	X
GP 2.13 Review Performance with Higher-level Management																	X					
GP 2.14 Take Corrective Action	X																					
GP 2.15 Coordinate with Stakeholders	X																	X				

11